GEH-5967 Installation Instrutions

MicroVersaTrip® Plus and PM Conversion Kits

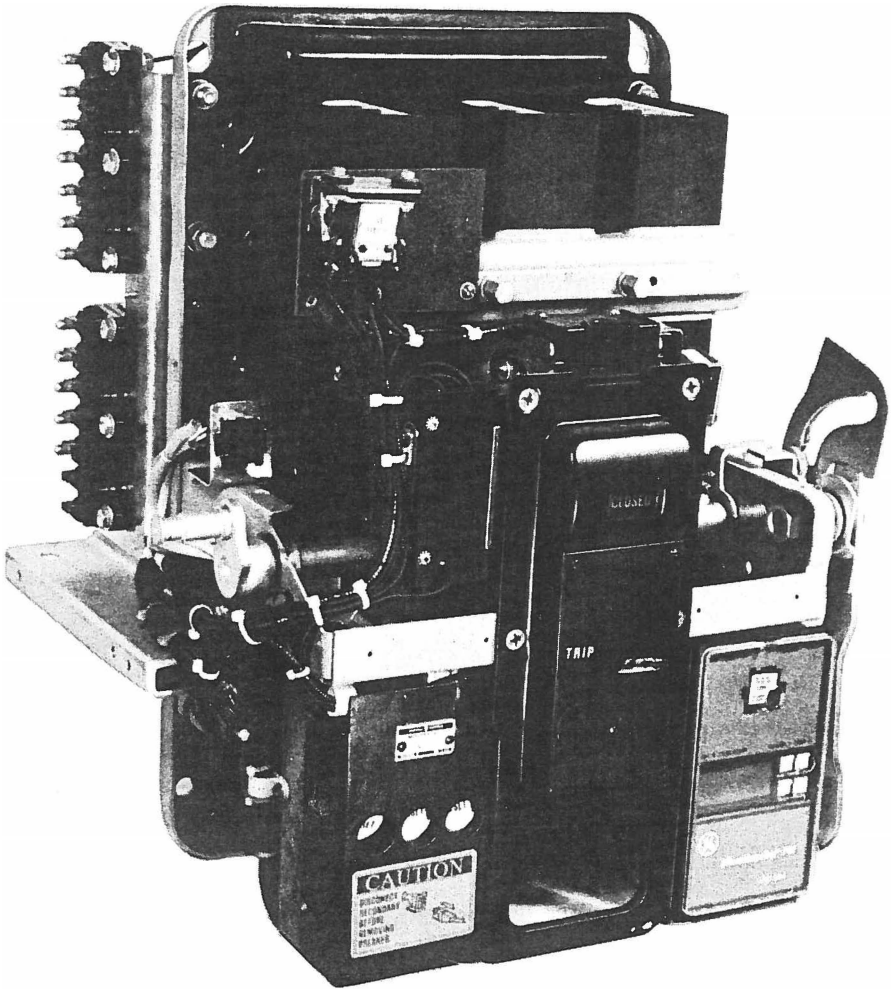
For GE Types AK-15, AK-25, AKU-25, AKR-30S, AKRU-30S Low Voltage Power Circuit Breakers

Introduction

ABB owned GE Conversion Kits are designed to upgrade existing GE Low Voltage Power Circuit Breakers, rather than replace, the entire breaker. The Conversion Kits contain enhanced solid-state MicroVersaTrip® Plus or MicroVersaTrip® PM trip units, representing the latest technological advancements in GE trip systems.

MicroVersaTrip® Plus and MicroVersaTrip® PM Conversion Kits are designed and breaker-tested to conform with ANSI standard C37.59, allowing the retrofitter to properly install and acceptance test the breaker.

This publication covers installation of MicroVersaTrip® Plus and MicroVersaTrip® PM Conversion Kits on GE types AK-15, AK-25, AKU-25, AKR-30S, AKRU-30S Low Voltage Power Circuit Breakers. Each Conversion Kit contains all appropriate material to convert from an existing EC Power Sensor, ECS or SST trip system, or upgrade MicroVersaTrip and Micro VersaTrip RMS-9 trip systems.



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SECTION 1 GENERAL INFORMATION

GE Conversion Kit installation is straightforward, but does require careful workmanship and attention to these instructions. Familiarity with the breaker itself is highly desirable. The general approach is to first strip the breaker of its existing trip devices, then install the MicroVersaTrip® Plus or PM Kit components. Following this procedure, the converted breaker is performance tested, prior to restoring the breaker to service

The majority of breaker kit installations do not require any customized assembly work. However, some conversions may involve unusual mounting circumstances or accessory combinations which necessitate minor modification and/or relocation of a component(s). In most instances this supplementary work can be done on site.

Preparatory to the conversion, the installer should verify that the appropriate current sensors and Programmable trip unit have been furnished. When ever the ground fault trip element is furnished for breakers applied on 4-wire systems, note that an associated neutral sensor (CT) is required for separate mounting in the equipment. Make sure that retrofitted breakers are applied within their short circuit rating. For example, when the trip elements of the breaker are to be changed from long-time instantaneous to long-time, short-time, the short-time rating would govern the application. As a service- re- lated consideration, the installation of the MicroVersaTrip Plus or PM kits provides an excel- lent opportunity to perform normal maintenance on the breaker, particularly when the front and back frames are separated. Such procedures are de-scribed in the installation and maintenance manuals supplied with the breakers and equipment.

SECTION 2 - PRIOR TO INSTALLATION

Before starting any work, turn off and lock out all power sources leading to the breaker (primary and secondary). Remove the breaker to a clean, well lighted work area.

> WARNING: Low Voltage Power Circuit Breakers utilize high speed, stored energy spring operating mechanisms. The breakers and their enclosures contain interlocks and safety features intended to provide safe, proper operating sequences. For maximum personnel protection associated with installation, operation, and maintenance of these breakers the following procedures must be followed. Failure to follow these procedures may result in personal injury or property damage.

- Only qualified persons, as defined in the National Electrical Code, who are familiar with the installation and maintenance of low voltage power circuit breakers, and switchgear assemblies, should perform any work associated with these breakers.
- Completely read and understand all instructions before attempting any breaker installation, operation, maintenance, or modification.
- Turn off and lock out the power source feeding the breaker prior to attempting any installation, maintenance, or modification. Follow all lock-out and tagging rules of the National Electrical Code and all other applicable codes.
- Do not work on a closed breaker or a breaker with the closing springs charged. Trip OPEN the breaker and be sure the stored energy springs are discharged avoiding the possibility that the breakers may trip OPEN or the charging springs discharge, causing injuries.
- For both stationary and draw out breakers, trip OPEN, then remove the breaker to a well lighted work area before beginning work.
- Do not perform any maintenance including breaker charging, closing, tripping, or any other function which could cause significant movement of the breaker while it is on the draw out extension rails.
- Do not leave the breaker in an intermediate position in the switchgear compartment. Always leave it in the **CONNECTED, TEST**, or **DISCONNECTED** position. Failure to do so could lead to improper positioning of the breaker and flashback.

SECTION 3 FRONT FRAME BREAKER CONVERSION

The front frame conversion consists of the following:

1. Separation of the front and back breaker frames (for AK-15 and AK-25 only). Refer to the appropriate installation and maintenance manuals supplied with the breakers and equipment for instruction on accomplishing the separation. Copies of these publications may be obtained from your local ABB sales office.
2. Remove the existing trip devices.
3. On electrically operated type AK-2-25 and AK- 2A-25 breakers with EC trip devices, relocating and remounting the x and y relays.
4. Installing the flux shifter and trip paddle.
5. Installing the programmer mounting bracket.
6. Installing the programmer and communications wire harness.

Separating the Breaker Frames

Verify that the breaker is OPEN, then perform the following steps:

Step 1.

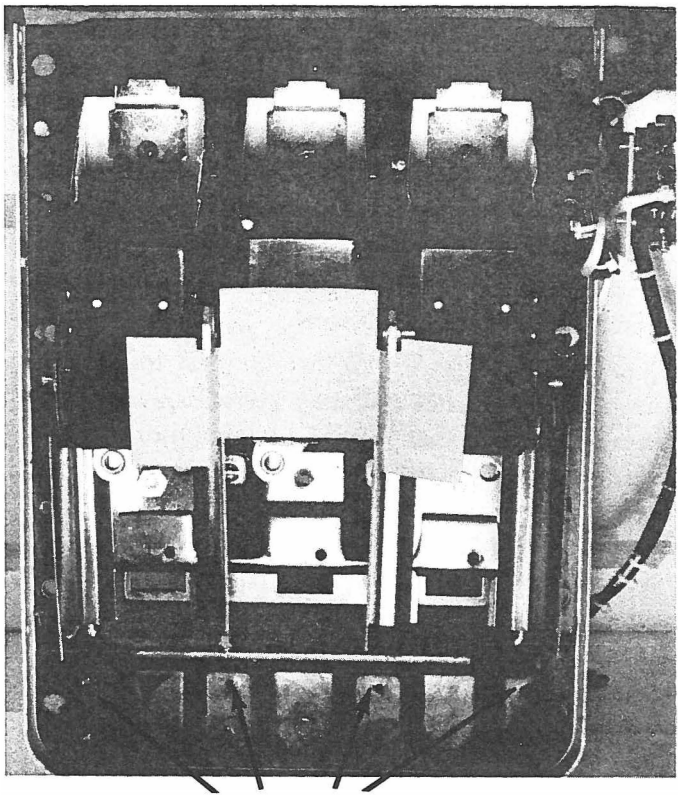
Remove the steel arc quencher retainer by loosening the two 1I4 x 20 hex capnuts. On electrically operated AK-3/3A-25 breakers, the Y relay is mounted on the left end of the retainer so there is no need to remove it. On AK-3/2A-25 breakers, it is mounted on the right side and will have to be moved to the left side. The steps are shown on page 5.

Step 2

Remove the three arc quenchers by lifting upward and outward.

Step 3.

Separate the breaker's front and back frames. (refer to the appropriate maintenance manuals.



LOCATION OF EC SUPPORT BRACKETS

Remove the Existing Trip Devices

Step 1.

Remove the over current trip devices.

Step 2.

On draw out breakers, remove the primary disconnect fingers from the bottom (load-side) copper studs.

Step 3.

Remove the three bottom (load side) copper stud assemblies. On Power Sensor equipped breakers, this will have been done during Step 1.

Step 4.

On EC equipped breakers, remove and discard the four trip device support brackets mounted along the lower front of the back frame. See Fig. 3-1. At this point the breaker back frame is ready for installation of the Conversion Kit components provided.

SECTION 3 FRONT FRAME BREAKER CONVERSION

Remounting X and Y Relays

On electrically operated breakers equipped with EC trip device, the Y relay is mounted on the front frame at the right side of the operation mechanism.

Step 1.

To provide mounting space for the new flux shift trip device, remove the Y relay and remount it on the left end of the arc quencher retainer as shown in Figs. 3-2 and 3-3 (using hardware and parts included) .

Step 2.

Modify the breaker's wiring harness to suit. The X relay should be remounted after the programmer mount and bracket are installed. See installing the programmer bracket and Fig. 3-8.

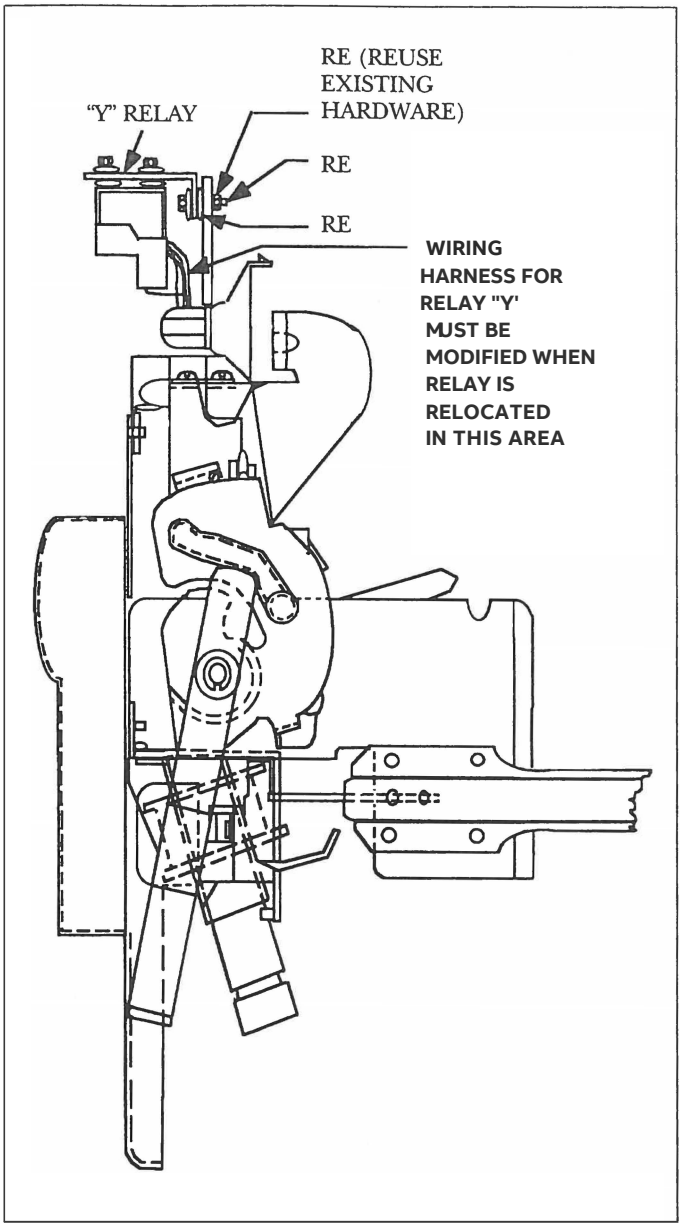
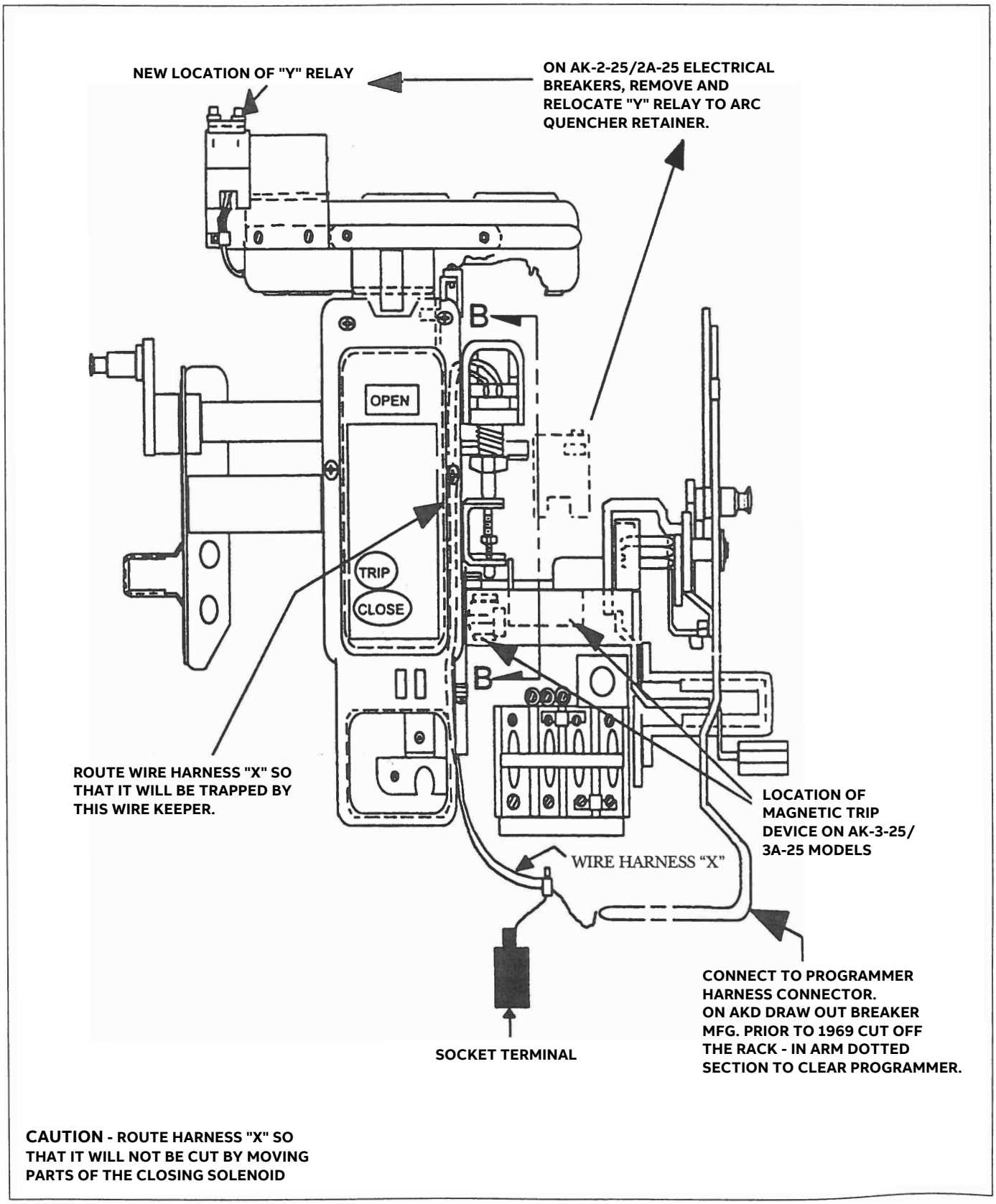


Fig. 3-2. Right Side View of Front Frame

Remounting X and Y Relays (Cont'd)



Ftg. 3-3. Front View of Front Frame (AKI> Type Draw Out Shown)

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter

The Flux Shifter trip device is mounted to the right of the operating mechanism as shown in Fig. 3-6.

Step 1.
Remove the existing flux shifter device.

Step 2.
Mount the flux shifter trip paddle on the breaker's trip shaft per Figs. 3-6 and 3-8. Pushing the draw out locking lever in will allow the trip bar to rotate to an easily accessible point.

Step 3.
Install the flux shifter actuating bushing in the right hand operation link, enlarging the link hole if necessary. See Fig. 3-8.

Step 4.
Mount the flux shifter assembly to the right side of the front frame as shown in Fig. 3-6. On Power Sensor breakers equipped with shunt trip, mount the flux shifter on top of the shunt trip bracket. If no shunt trip is installed, use the 1/8" spacer provided (Fig. 3. 7) .

Step 5.
When the flux shifter and its trip paddle are installed and the front and back breaker frames are reassembled, the following adjustment must be made. Note that the back frame must be converted first.

With the breaker in the OPEN position and the mechanism fully charged, set the gap between the trip paddle and the end of the flux shifter trip rod at .093 to . 125 inches. Use a 0.100-inch diameter rod (not supplied) as shown in Fig. 3-8. Set the adjuster end of the trip rod and lock it in place with the jam nut.

OPTIONAL TEST: The flux shifter assembly may be tested by closing the breaker and applying a 9 V dc power source to the flux shifter leads. The red wire is the positive lead. The breaker should trip.

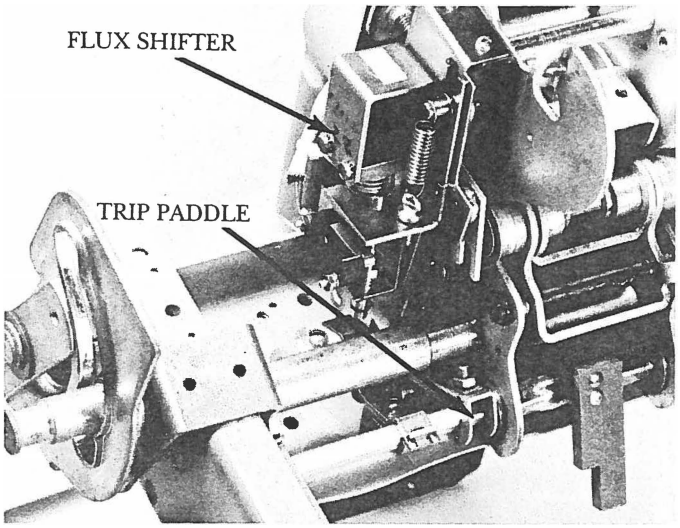


Fig. 3-6. Rear View of Front Frame Showing Location of Trip Paddle for Flux Shift Trip Device

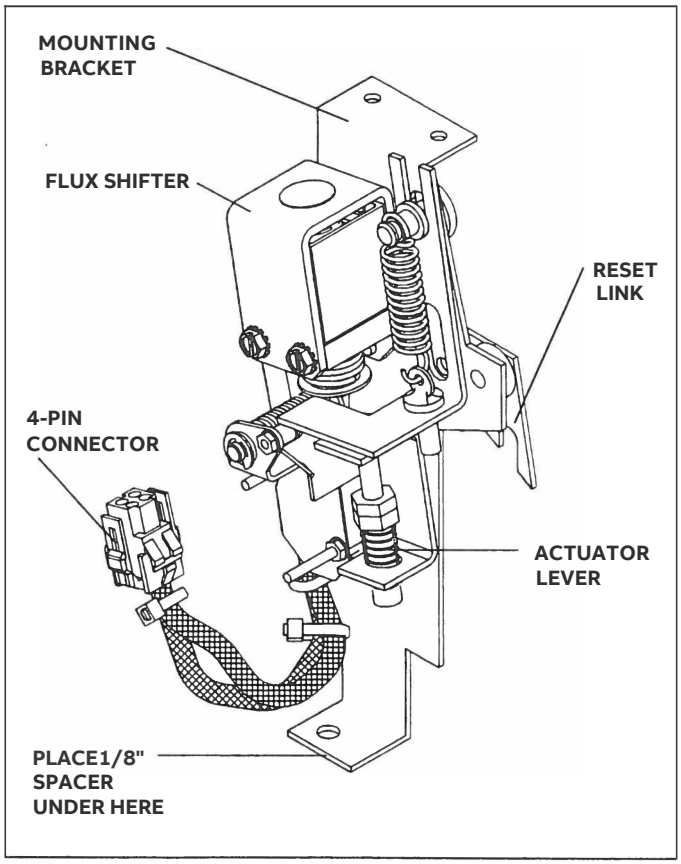


Fig. 3-7. Side View of Flux Shifter Installed

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SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Flux Shifter ᵖƵÙŭ)ĭþ

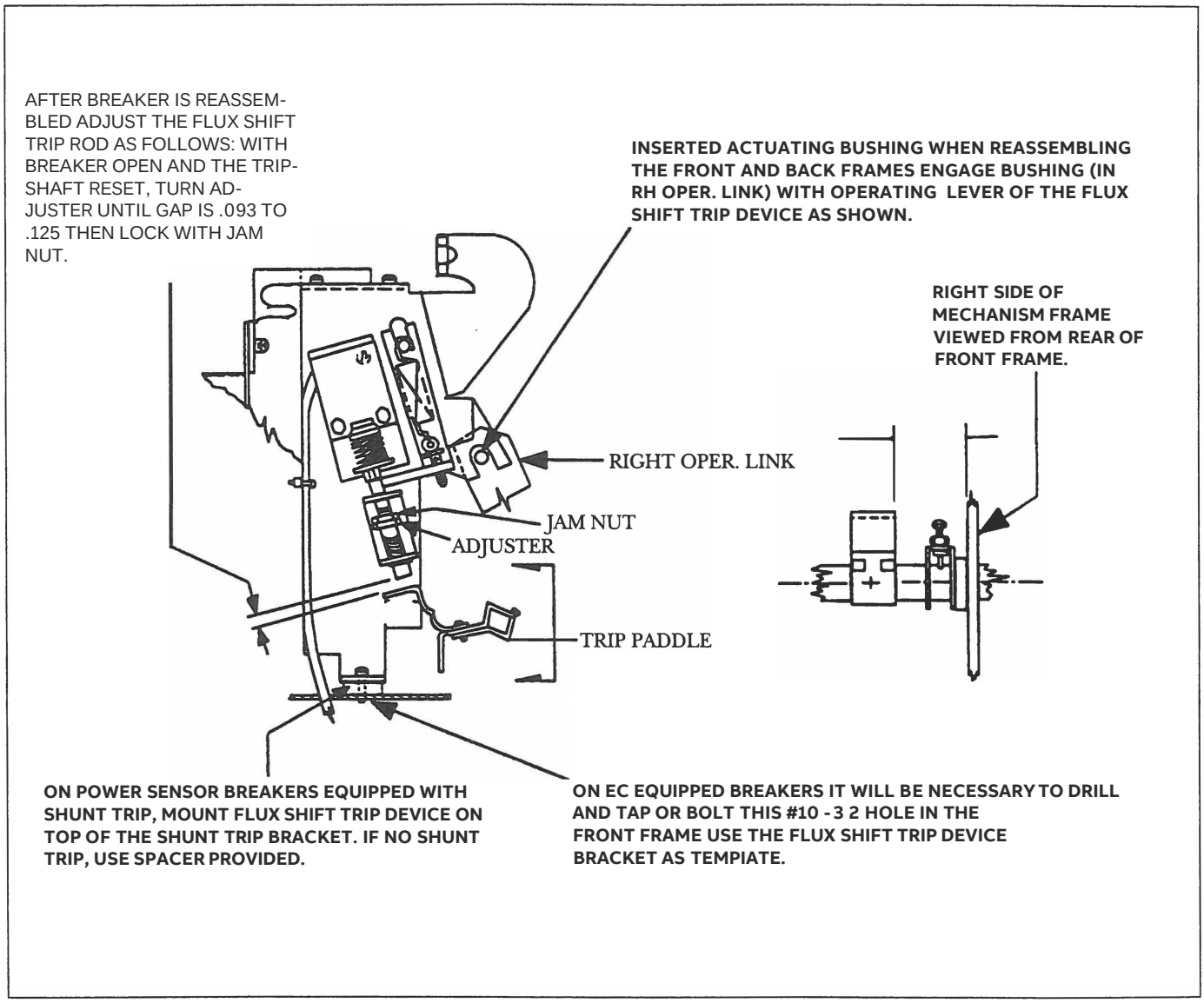

FIG. 3-8. Right Side View of Mechanism Frame Showing Mounting of Flux Shift Trip Device

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Programmer Bracket

The MicroVersaTrip® Plus or PM programmer mounts to the lower right side of the breaker.

Step 1.
Assemble the programmer shock mount bracket to the programmer support bracket per Fig. 3-9.

Step 2.
Mount the X relay on the bracket using (3) #10 screws and lock washers provided, see Fig. 3-9.

Step 3.
Modify the X relay harness by adding 16 gauge extension wire, splices and ring terminals provided. Work one wire at a time. Route the wires as shown in Fig. 3-10, making certain that they do not interfere with the solenoid plunger or programmer.

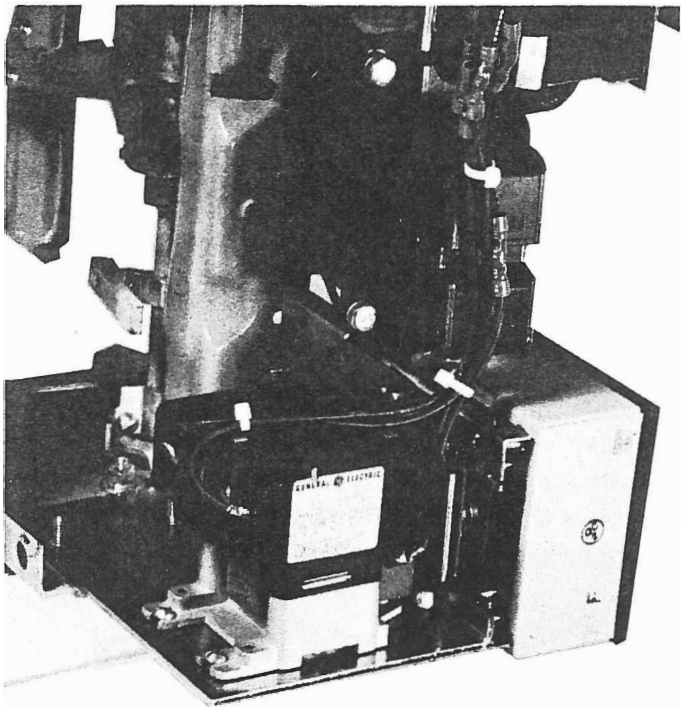

Fig. 3-10. X Relay Wire Routing

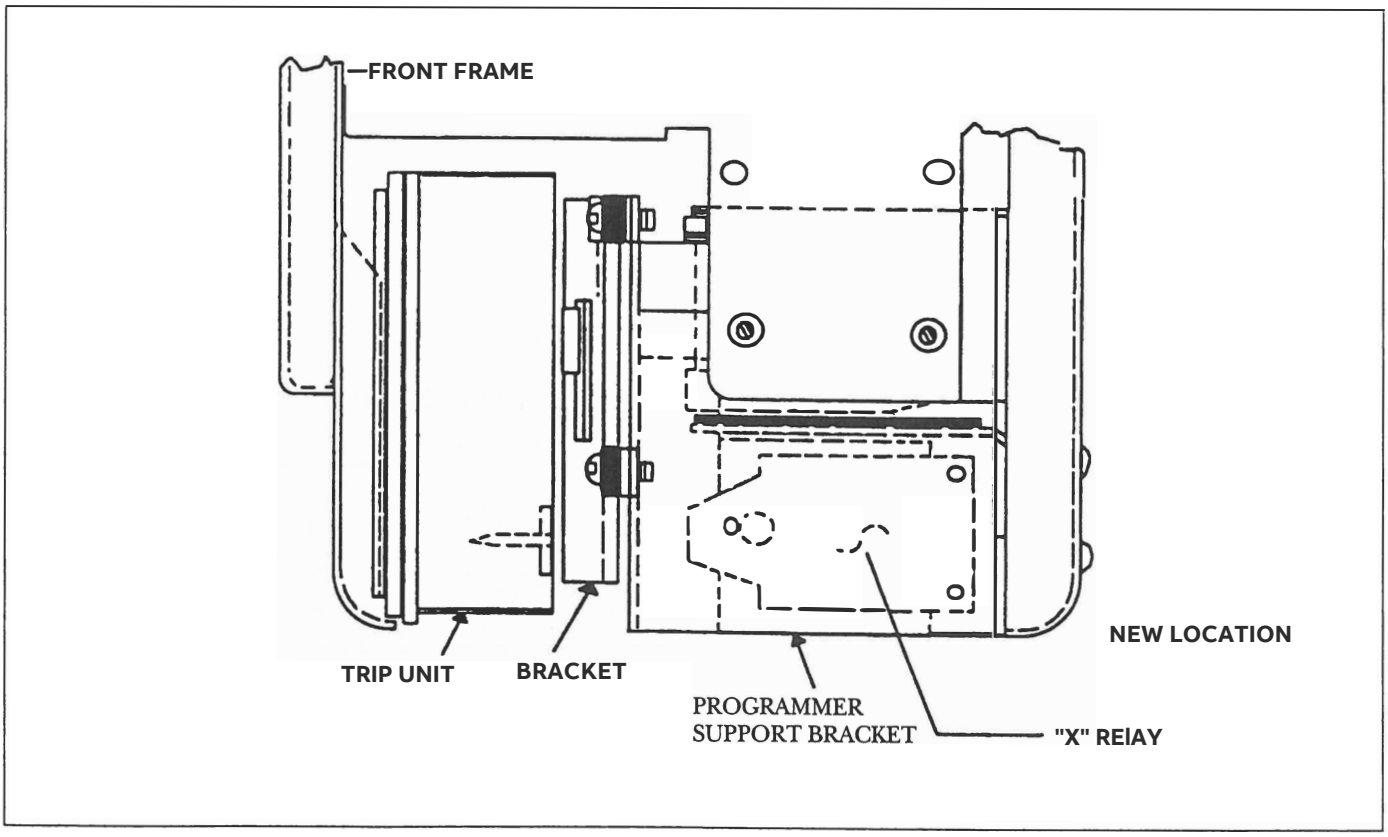

Fig. 3-9. Right Side View Showing Mounting Position of Programmer Unit

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Programmer Bracket

The programmer harness consists of the mating 36-pin programmer connector and the associated wiring.

Step 1.
Assemble the adapter bracket to the 3 6-pin programmer connector (with bevels to right side) by pushing the bracket over the notches in ends of plug body (Step 1) . Follow Steps 2 through 5 of Fig. 3-11 to complete assembly of programmer harness to programmer bracket.

CAUTION: The adapter bracket must be installed onto harness plug as shown in Fig. 3-11. Failure to do so will result in harness plug failure and programmer will not provide any protection.

Step 2.
Plug the 4-pin wiring harness connector into the mating plug on the flux shifter assembly.

NOTE: The current sensor leads can be connected after the front and back frames are joined.

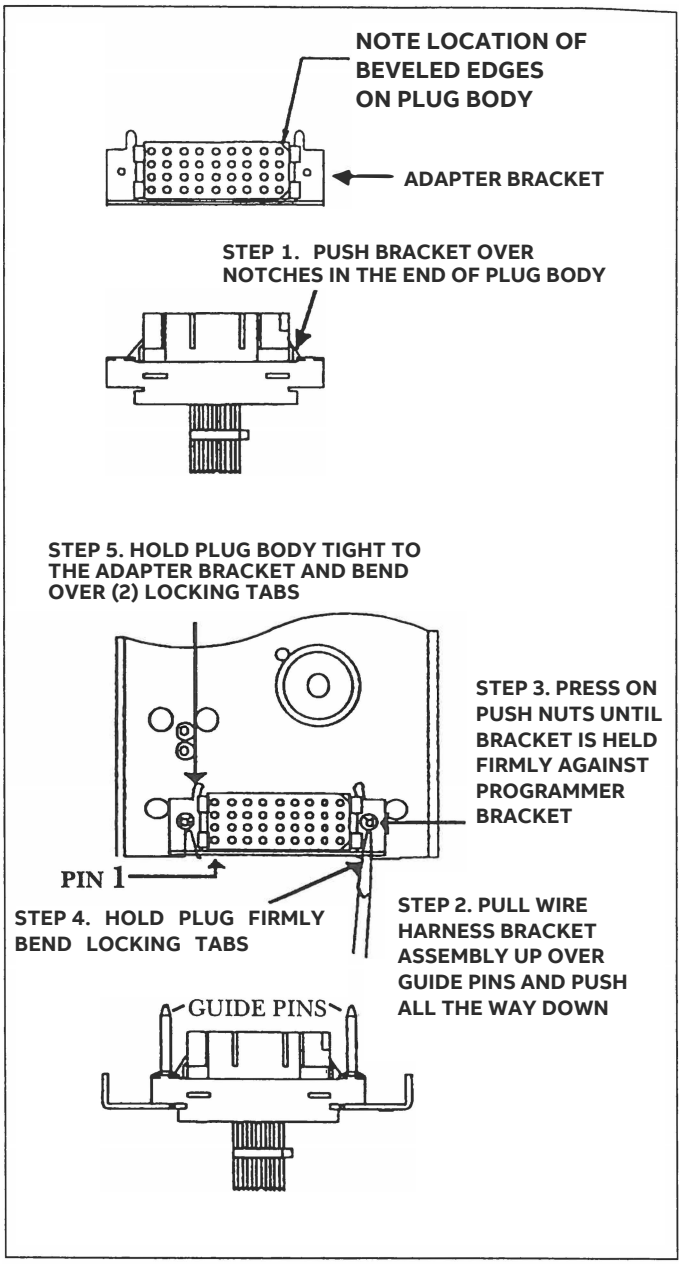

Fig. 3-11. Programmer Harness Connector

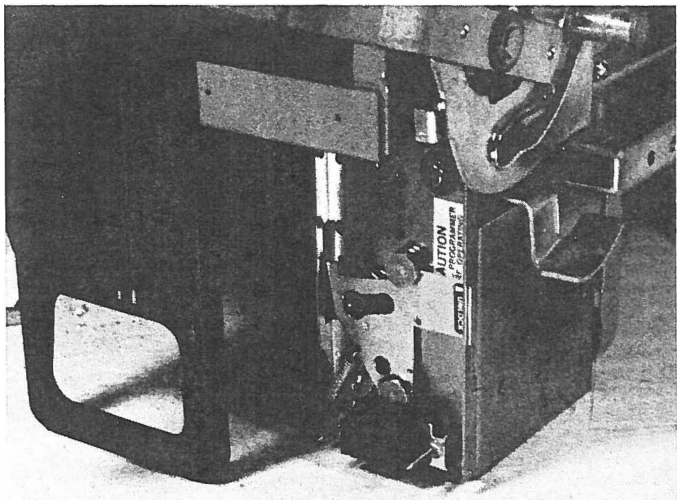

Fig. 3-12. Programmer Plate Installation

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Communication Harness (When Required)

The communication harness should be installed on the breaker compartment's door hinge side, to protect it from damage when operating the compartment door. Fig. 3-13 and 3-15 show the mounting and installation sequence for AK-15 and 25 breakers. A caution label, Fig. 3-14, should be mounted on the breaker and the compartment door as a warning to prevent unnecessary damage.

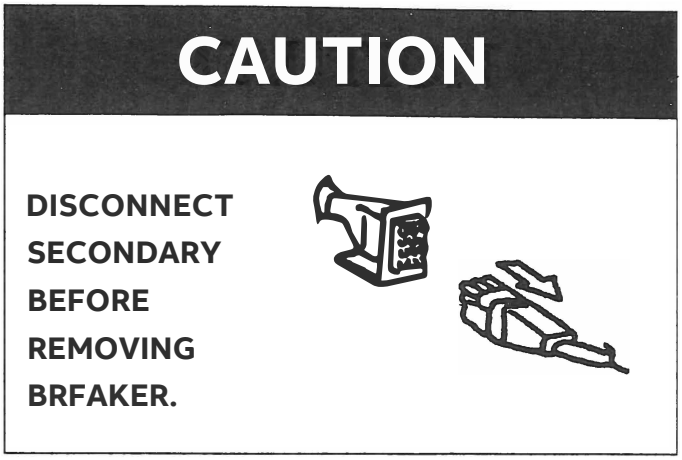

Fig. 3-14. Caution Label

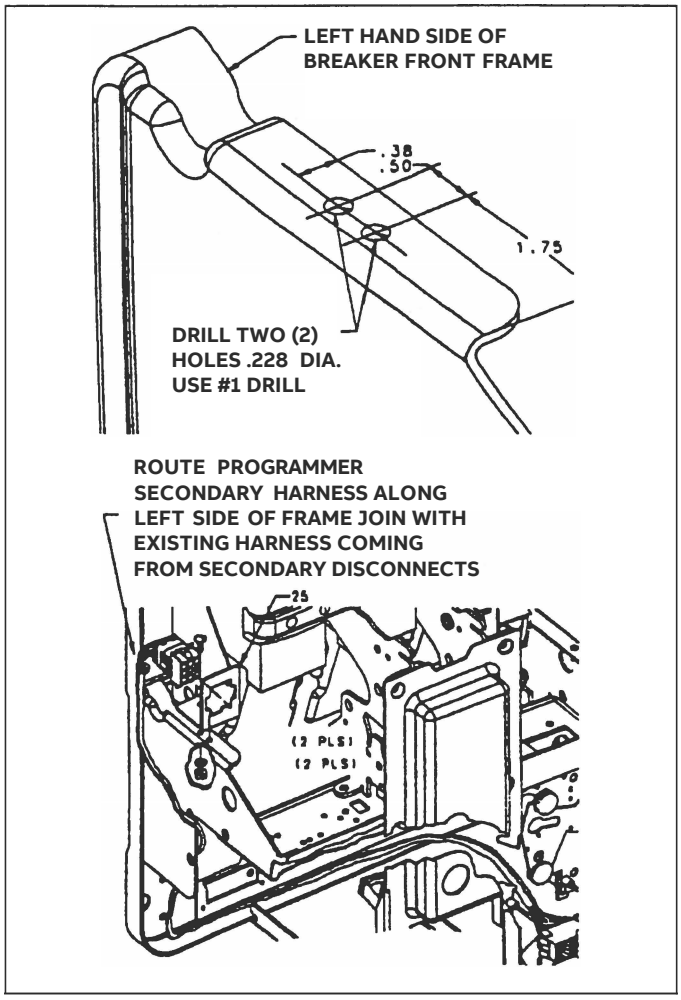

Fig. 3-13. AK-15/25 Harness Installation

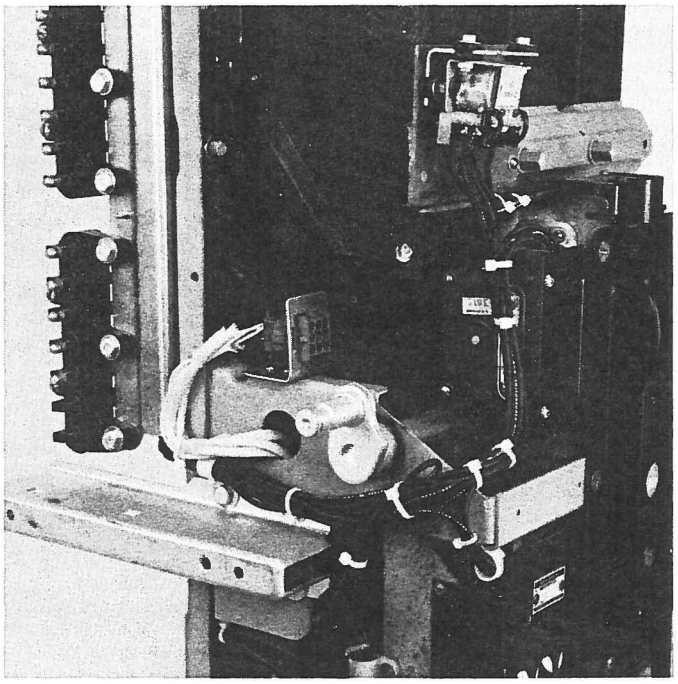

Fig. 3-15. AK-25IAKR-30S
Communications Harness Installation

SECTION 3 FRONT FRAME BREAKER CONVERSION

Installing the Communication Harness (When Required) Cont'd

Fig. 3-16 shows the drill and mounting hole pattern for AKR-30S series breakers. For this type of breaker with a 4th wire disconnect device, the communication harness must be mounted on the left hand side. Hole locations given are for reference only.

The communications disconnect plug location should be determined by a field engineer during job assessment.

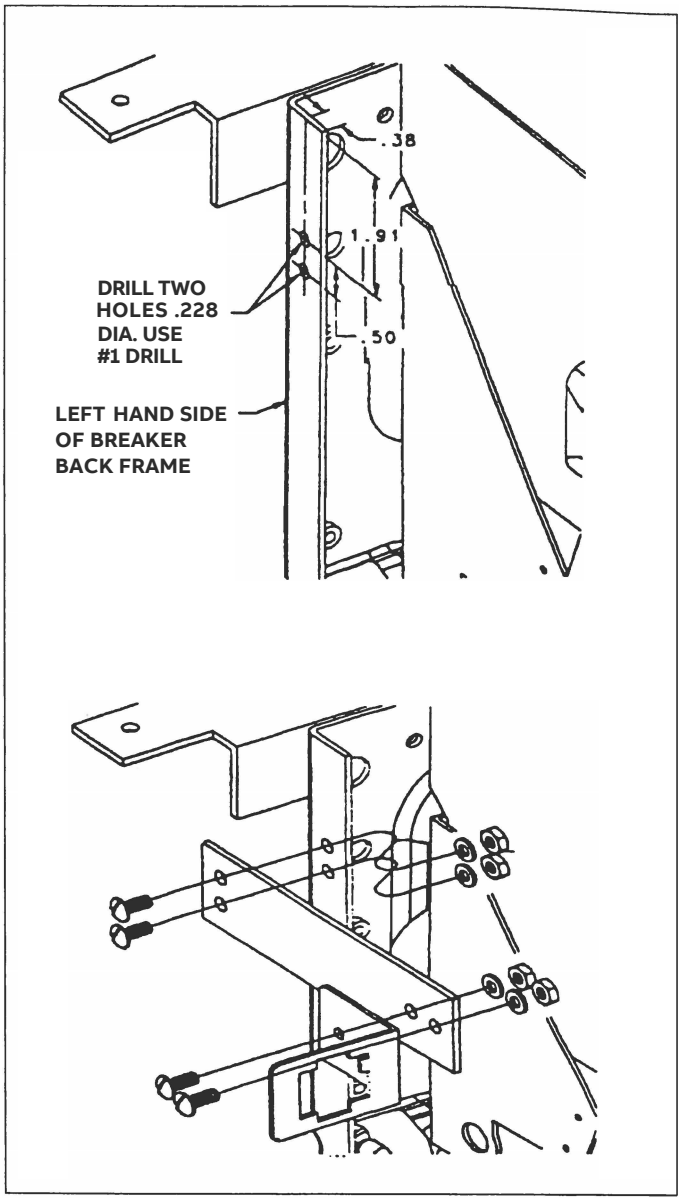

Fig. 3-15. AKR-30S Harness Installation.

SECTION 4 BACK FRAME BREAKER CONVERSION

Installing Phase Sensors (CT's)

Phase sensor modification for the AK-15 and AK-25 circuit breakers is completed by mounting the three current sensor assemblies to the back frame. See Fig. 4-1, 4-2, and 4-3.

Step 1.
Insert lower copper stud through the back plate and attach it via the mounting screw.

Step 2.
Position the CT with its terminal toward the rear and loosely mount it to the stud with copper, 90° angled bus strap and the bolt provided.

Step 3.
Align the assembly, then torque the two Ya" bolts in the strap to 250 in.-lbs. each to assure proper contact integrity.

Step 4.
Install the CT terminal board-mounting bracket below the CT's using the (2) 8-32 x 1/2" screws provided. See Fig. 4-3. Mount terminal boards TB1, TB2, and TB3 to the bracket using the (6) 6-32 x 1/2" screws and washers provided.

Step 5.
Reassemble the front and back frames.

Step 6.
The wiring harness can be connected to the CT's only after the front and back frames have been joined. Fig. 4-4 shows a converted back frame and the wiring connections as they will look after joined.

NOTE: Ocassionally, during current sensor manufacturing, a slight separation occurs of the epoxy from the plastic shell. This may amount to as much as 0.030" and has no effect on performance. Additionally, slight surface imperfections are part of the epoxy curing process and have no effect on performance.

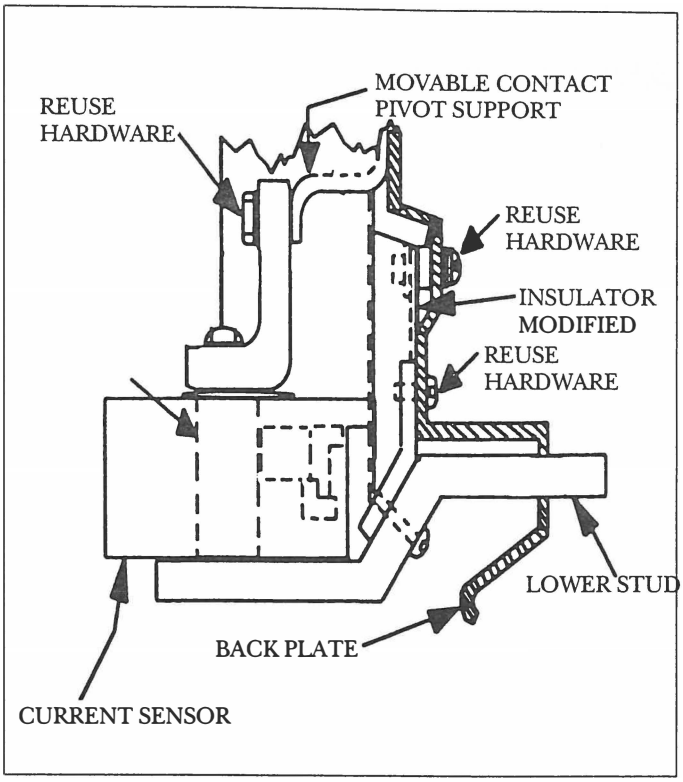

Fig. 4-1. Phase Sensor Assembly, Right Side View

SECTION 4 BACK FRAME BREAKER CONVERSION

Installing Phase Sensors (CT's) Cont'd

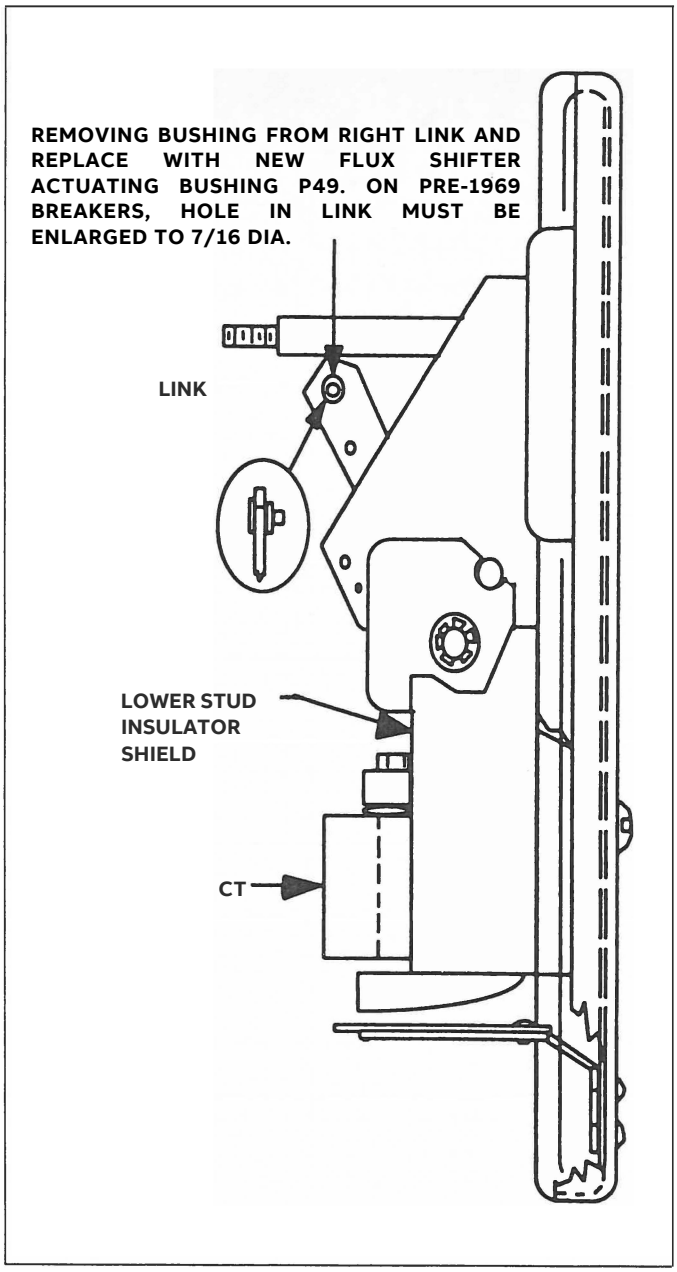

Fig. 4-2. Right Side View of Back Frame

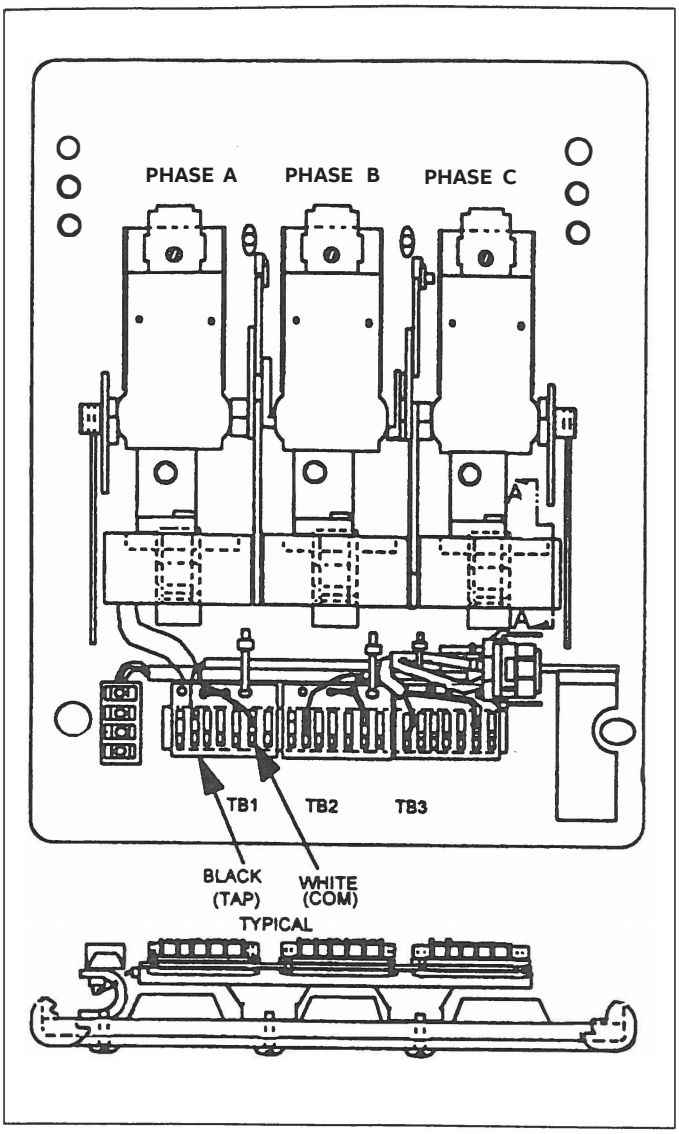

Fig. 4-3. Back Frame Assembly

SECTION 4 BACK FRAME BREAKER CONVERSION

Installing Phase Sensors (CT's) Cont'd

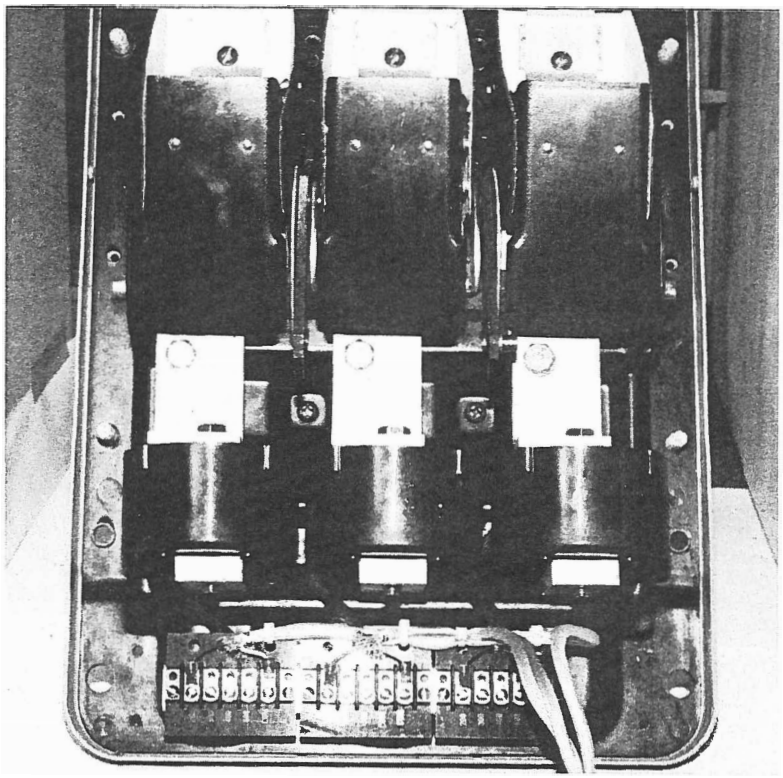

Fig. 4-4. AKU-25 Back Frame with MicroVersaTrip® PM Conversion Components Installed

SECTION 4 BACK FRAME BREAKER CONVERSION

Installing Phase Sensors (CT's) Cont'd

Phase sensor modification for the AKR-30S circuit breakers is as follows:

Step 1.
Remove the 3/8 11 bolt holding the top copper bus stop to the contact arm. See Fig. 4-5.

Step 2.
Loosen the 1/4 11 bolt holding the same copper strap to the round CT post. Slide the strap off the post.
See Fig. 4-5.

Step 3.
Replace the CT with the MicroVersaTrip® CT provided with the kit. The terminals should point down.

Step 4.
Reassemble the copper bus removed in steps 1 & 2. See Fig. 4-6.

NOTE: Occasionally, during current sensor manufacturing, a slight separation occurs of the epoxy from the plastic shell. This may amount to as much as 0.03011 and has no effect on performance. Additionally, slight surface imperfections are part of the epoxy curing process and have no effect on performance.

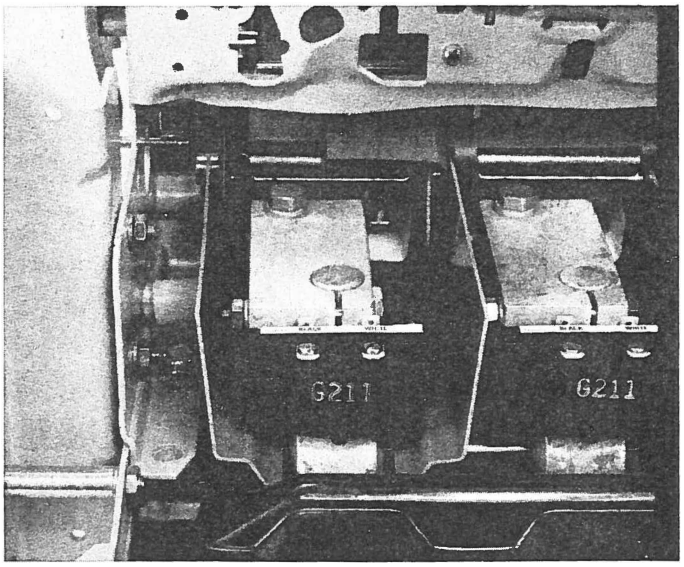

Fig. 4-5. Removal of the Phase Sensors on AKR-30S Breakers

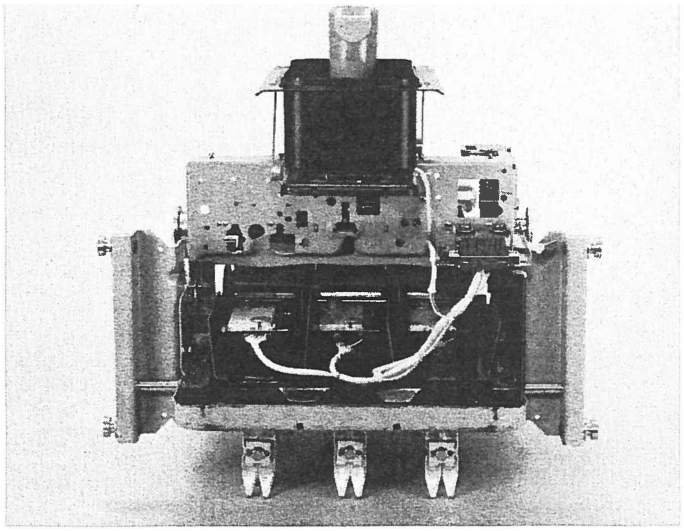

Fig. 4-6 AKR-30S Breaker with MicroVersaTrip® Phase Sensors.

SECTION 5 FOUR WIRE GROUND FAULT OPTION

The MicroVersaTrip® Plus and PM Ground Fault option requires an additional neutral sensor when used on a four-wire system having its neutral grounded at the transformer. The phase sensors are mounted on the breaker. However, the neutral sensor is inserted in the neutral bus, which is part of the equipment. The neutral sensor is connected to the breaker through the 4th-wire neutral disconnect.

Wire harness installation depends on whether the breaker is a 4-wire draw out or a 4-wire stationary system.

DRAW OUT BREAKERS

Step 1.

Mount the neutral sensor disconnect block to the rear of the back frame per Fig. 5-1. Use existing mounting holes.

Step 2.

Feed the end of the harness through the hole "X" in the back frame and connect leads to the block.

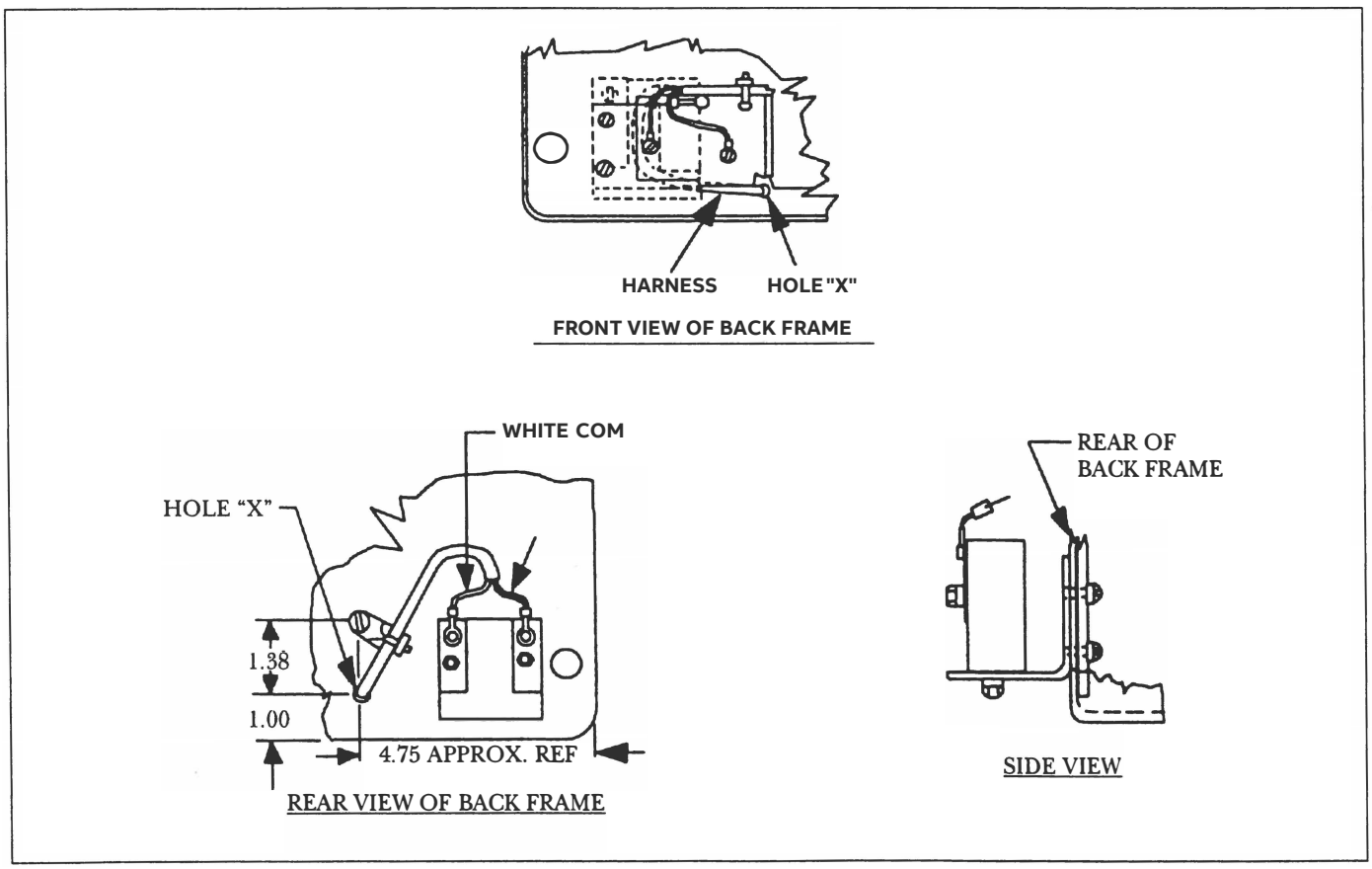

Fig. 5-1. Mounting Detail for Secondary Disconnect Block for 4th Wrre Neutral Sensor (Draw Out Breakers Only)

SECTION 5 FOUR WIRE GROUND FAULT OPTION

STATIONARY BREAKERS

Step 1.

Mount neutral sensor terminal board TB5 to the back frame.

Step 2.

Feed the end of the wire harness to the terminal board and connect as shown in Fig. 5-2.

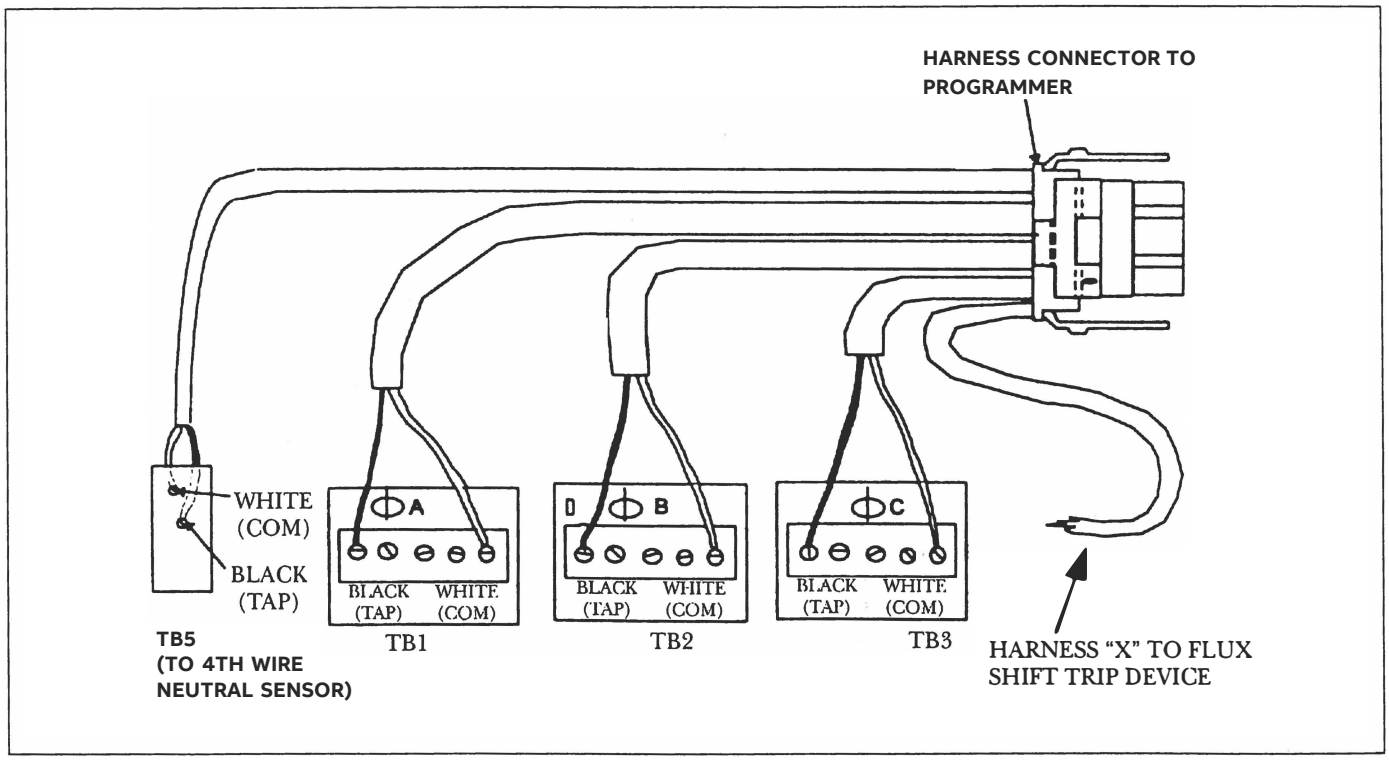

Fig. 5-2. Harness Connections for Stationary Breakers Equipped with 4-Wrre Ground Fault

SECTION 5 FOUR WIRE GROUND FAULT OPTION

Installing Neutral Sensors (when required)

The neutral sensor is an electrical duplicate of the phase sensor, including the taps. therefore, when taps (if provided) are changed on the phase sensors, the taps on the neutral sensor must be correspondingly positioned. For kits with fixed phase sensors, be sure to use the corresponding tap on the neutral sensor.

The following modifications are required only in conjunction with breakers being equipped with 4-wire Ground Fault trip elements.

Step 1.

Mount the neutral sensor (CT) in the outgoing neutral lead, normally in the equipment's bus or cable compartment. See Fig. 5-3 for the sensor's bar drilling plan. Check to insure that the neutral and phase sensors match, i. e., have the same ampere range.

Step 2.

Connect the neutral sensor to the disconnect block per wiring instructions of Fig. 5-4. For stationary breakers, the neutral sensor is connected to TB5.

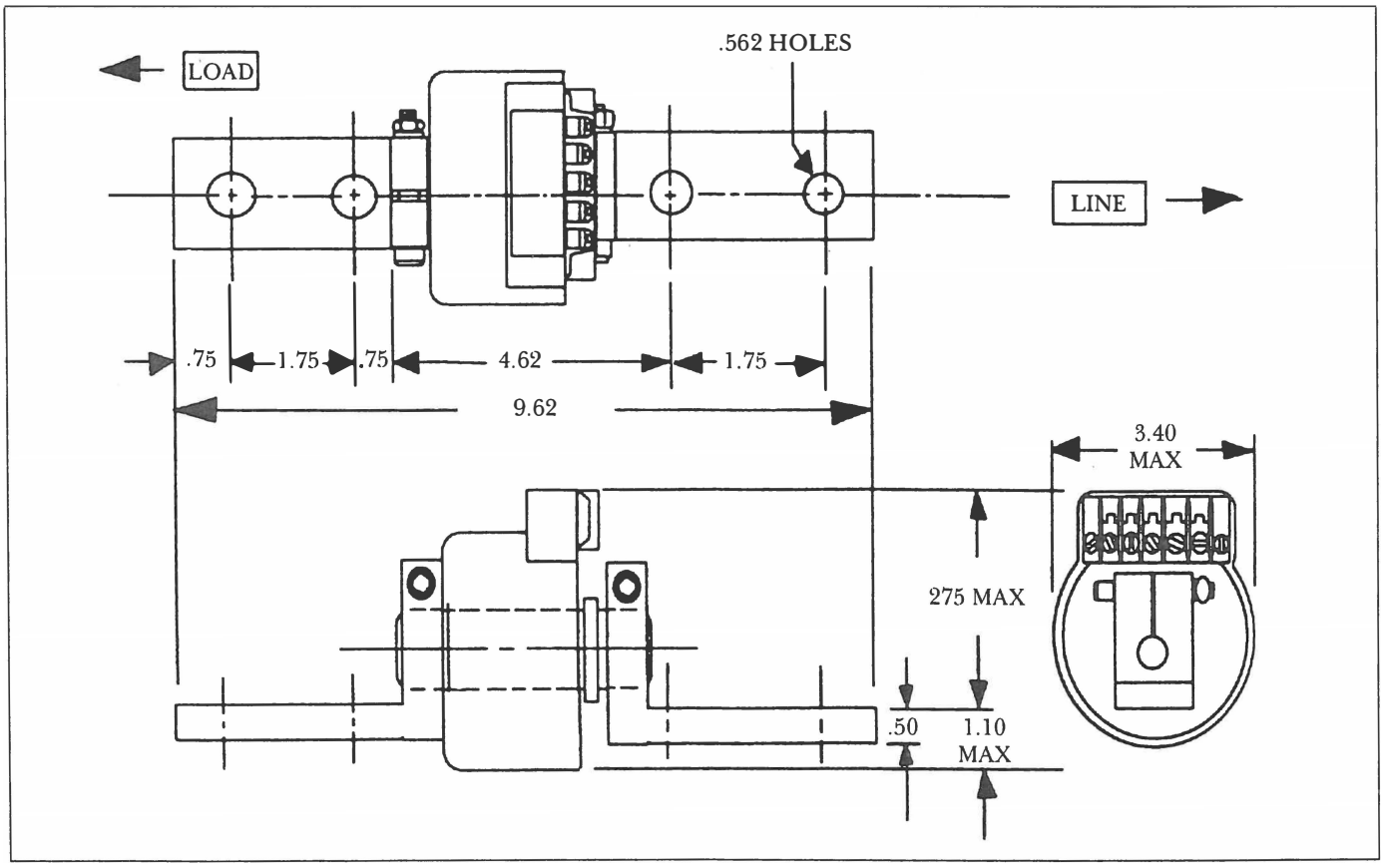

Fig. 5-3. Neutral Sensor Outline

SECTION 5 FOUR WIRE GROUND FAULT OPTION

Installing Neutral Sensors (Cont'd)

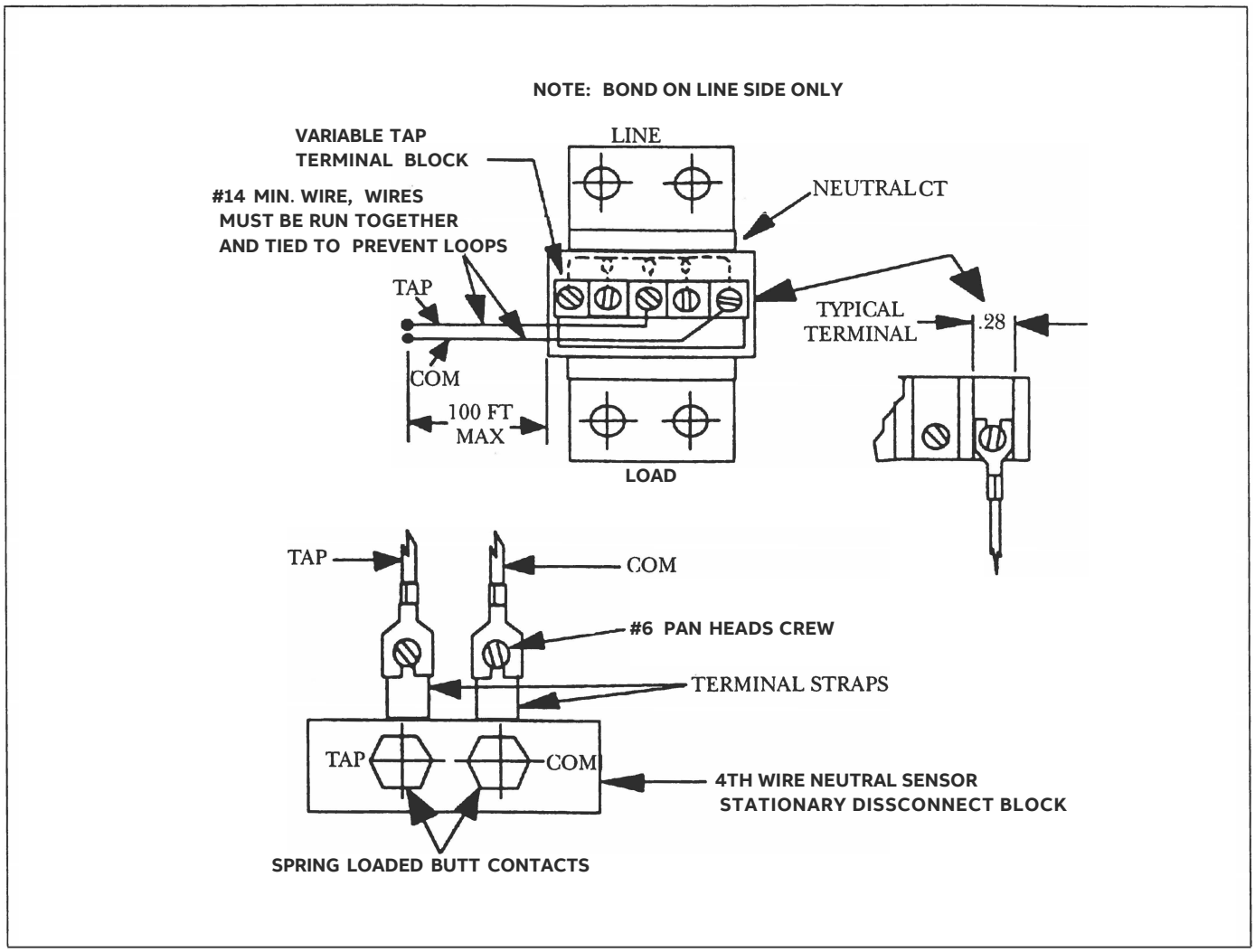

Fig. 54. Connecting the 4th Wire Neutral Sensor

SECTION 6 EQUIPMENT CONVERSION

The equipment conversion consists of:

1. Modifying the lower stud shield insulator.
2. Remounting the primary disconnect fingers.
3. Mounting the insulator bracket.
4. Installing the wire harness.

Stud Shield Modification

Modify the left and right pole lower stud insulator shields per Fig. 6-1. Remount on back plate using original screws and special nut supplied with the kit.

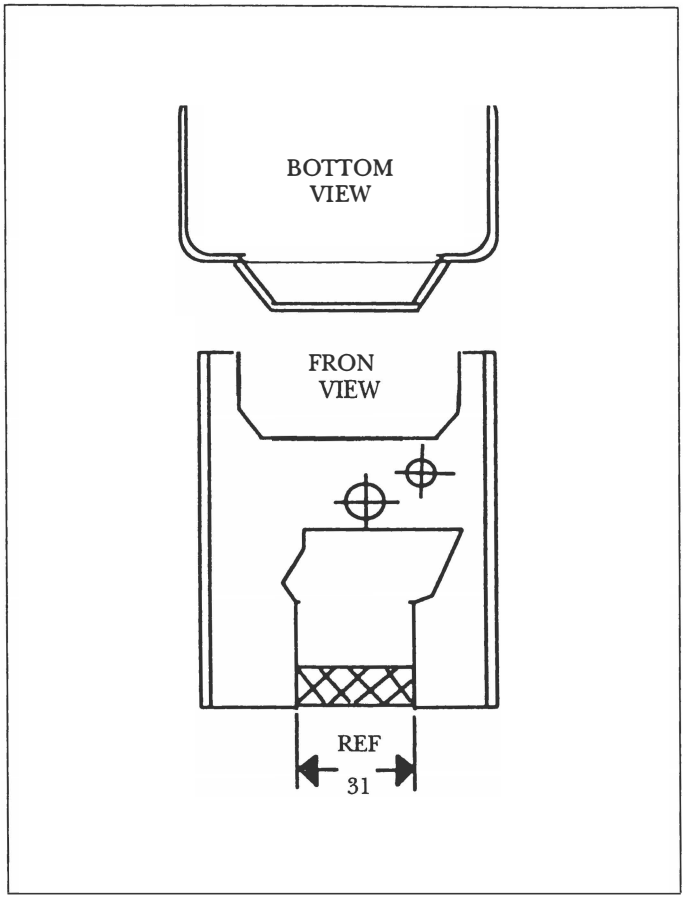

Fig. 6-1. Stud Insulator Modification

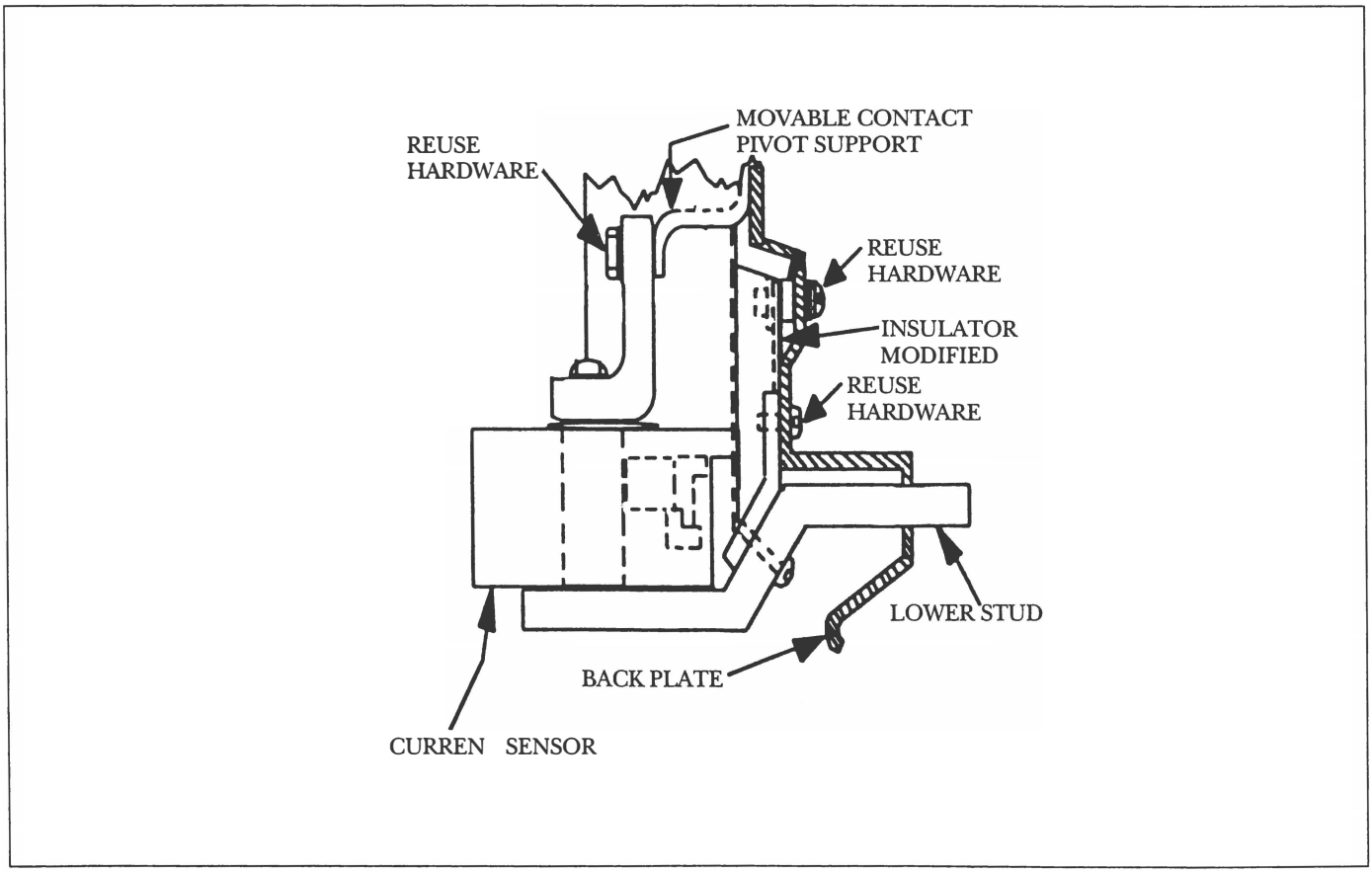

Fig. 6-2. Phase Sensor Assembly, Right Side View

SECTION 6 EQUIPMENT CONVERSION

Remounting Primary Disconnect Fingers

DRAW OUT BREAKERS

Remount the primary disconnect fingers on the new lower studs. Refer to appropriate maintenance manual.

Draw Out Breakers Type AK-15 Only:

Modify primary disconnects as follows: (Refer to Fig. 6-3)

Step 1.

Place spacer with off-center hole in the hole of the stud while sliding the new retainer completely on the stud.

Step 2.

Place the new retaining ring on the stud. Insert the tip of the upper fingers under the retaining ring and place the bow tie spacers in the fingers.

Step 3.

Place the retainer over the upper fingers and insert the bolt.

Step 4.

Insert the tip of the lower fingers under the retaining ring and place the bow tie-shaped spacers in the fingers. Locate the lower retainer to hold the bow tie-shaped spacers in place.

Step 5.

Place the cylindrical spacer and spring on the bolt and secure it with a washer and nut.

Step 6.

Tighten the nut to obtain 60-70 lbs. pressure per set of four fingers when spread W' apart, as shown, and lock with the second nut. If a pressure gauge is not available, compress the spring to a 1Yi611 dimension for proper pressure.

CAUTION: Adequate primary contact force is essential. Tighten the nuts on the 1/4 x 20 mounting bolts to obtain a spring dimension of 13/16 to 27/32. The proper dimension between contact fingers is 7/16". Proper contact force is 60 to 70 lbs. with the contacts spread to 1/2".

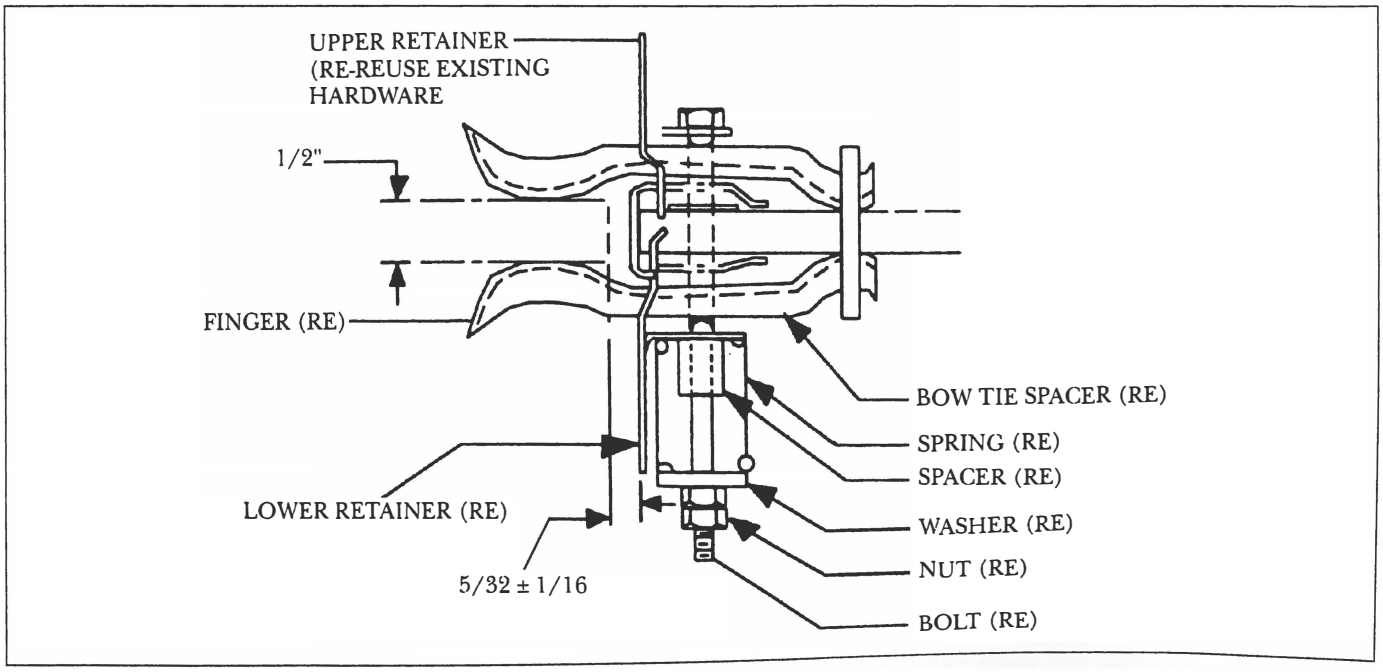

Fig. 6-3. Primary Disconnects for New Lower Stud

SECTION 6 EQUIPMENT CONVERSION

Installing the Insulator Bracket and Wire Harness

Mount insulator bracket to the lower right corner of the back frame utilizing existing holes.

Refer to Fig. 6-4.

The wire harness installation depends on whether the breaker is a 3-wire or 4-wire, draw out or stationary system:

Step. 1

For all draw out and stationary breakers with 3-wire systems, with and without ground fault, refer to Fig. 6-4. Connect the A, B, and C phase sensor leads respectively to TBl, TB2 and TB3. Identify by Table 6-1.

Step 2.

For all four-wire draw out breakers, connect the ground fault lead to the 41h wire disconnect block.

Step 3.

For all four-wire stationary breakers, connect the ground fault lead to the 41h wire terminal block.

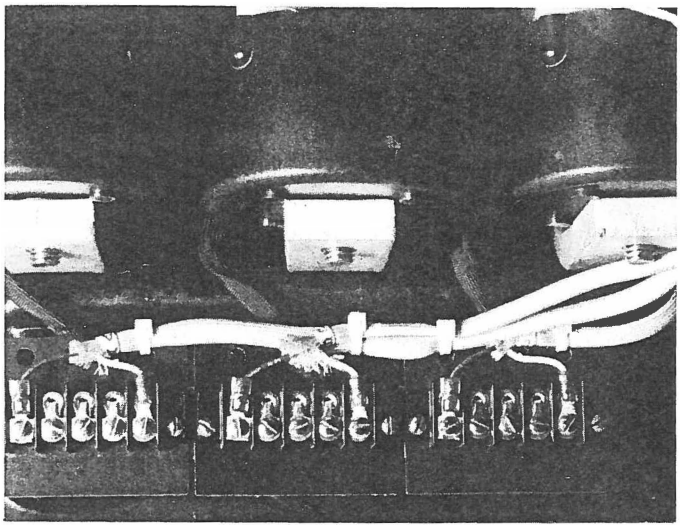

Fig. 6-4. Back Frame Wire Harness

Table 6-1. Harness Connections

Component	From Terminal Board	Wire Color	To Harness Connector Pin Number
Phase A Sensor	TBl	White Black	18 22
Phase B Sensor	TB2	White Black	19 23
Phase C Sensor	TB3	White Black	20 24
Flux shift Trip Device	Trip Device	Red White	32 28
4th-wire Neutral* Sensor	TBS or Secondary	White Black	21 17

*Used only with 4-wire Ground Fault

SECTION 7 INSTALLING THE PROGRAMMER

The programmer is attached to the bracket mounted to the lower right hand side of the breaker as shown in Fig. 7-1. The guide pins on this bracket mate with the holes on either side of the programmer box. The guide pins provide the necessary alignment for the connector engagement. The locking lever engages with the pin, which is assembled to the programmer frame and secures the programmer to the mounting bracket

To Install the Programmer

The mounting bracket is shown in Fig. 7-1. Installation is as follows:

Step 1.
Insert the guide pins into the holes and push on the programmer, engaging the connectors.

Step 2.
Release the locking lever, securing the programmer.

Step 3.
Verify that the locking lever actually engages the programmer pin.

To remove the programmer, pull the locking lever out and downward. This releases the programmer pin so that the programmer can be removed.

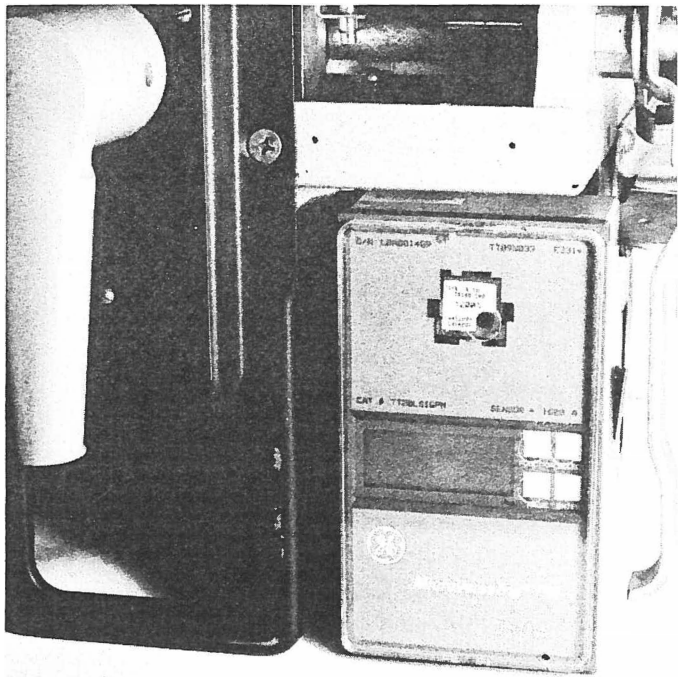

Fig. 7-1. Programmer Mounting for All Type AK-15, 25 and AKR-30S Breakers

SECTION 8 TESTING AND TROUBLESHOOTING

Once the breaker has been converted, but before it is energized, it must be tested. See below for troubleshooting details.

TESTING

Before installing a converted breaker back into service, perform the following steps:

Step 1.
Verify that the programmer is securely installed. The phase sensors must not be energized if they are open-circuited.

Step 2.
Megger the breaker primary circuit using a 1,000-Volt Megger.

Step 3.
To verify that the breaker has been properly retro-fitted, a primary injection test should be performed on each phase. This test will check the CTs, bus, wir-ing harness, flux shifter,and trip unit as a complete system. A high current, low voltage power supply should be connected across each line and load ter-minal to simulate an over current fault. The pro-grammer long-time may be set at 0.5 to minimize the breaker stress. When ground fault is installed, the test can be performed by wiring two adjacent poles in series. This will prevent the breaker from tripping due to an unbalance current flow. Do not attempt to use test kit Cat. No. TVTSl or TVRMS on this programmer.

TROUBLESHOOTING

When malfunctioning is suspected, first examine the circuit breaker and its power system for abnormal conditions such as:

1. Breaker not tripping in proper response to over currents or incipient ground faults.
2. Breaker remaining in a trip-free state due to mechanical interference along its trip shaft.
3. Inadvertent shunt trip activations.

WARNING: Do not change taps on the current sensors or adjust the trip unit settings while the breaker is carrying current.

False Tripping Breakers Equipped with Ground Fault

When nuisance tripping occurs on breakers equipped with the ground fault trip element, a probable cause is the existence of a false "ground" signal. Each phase sensor is connected to summing circuitry in the programmer. Under no-fault conditions on 3-wire load circuits, the currents add to zero, and no ground signal is developed. This current sum will be zero only if all three sensors have the same electrical characteristics. If one sensor differs from the others (i. e., different rating or wrong tap setting) , the circuitry can produce output sufficient to trip the breaker. Similarly, discontinuity between any sensor and the programmer unit can cause a false trip signal.

The sensors and their connections should be closely examined if nuisance tripping is encountered on any breaker whose Micro Versa Trip® Plus or PM components have previously demonstrated satisfactory performance. After disconnecting the breaker from all power sources, perform the following steps:

Step 1.
Check that all phase sensors are the same type (ampere range) .

Step 2.
Make sure that the tap settings on all three-phase sensors are identical.

Step 3.
Verify that the harness connections to the sensors meet the polarity constraints indicated by the cabling diagram, Fig. 8-1.

SECTION 8 TESTING AND TROUBLESHOOTING

FALSE TRIPPING BREAKERS EQUIPPED WITH GROUND FAULT (CONT'D)

Step 4.

On ground fault breakers serving four-wire loads, check that the neutral sensor is properly connected. See cabling diagram Fig. 8-1. In particular, the following :

A. Verify that the neutral sensor has the same rating and tap setting as the phase sensors.

B. Check continuity between the neutral sensor and its equipment-mounted secondary disconnect block. Also check for continuity from the breaker-mounted neutral secondary disconnect block through to the female harness connector.

C. If the breaker's lower studs connect to the supply source, then the neutral sensor must have its load end connected to the source. See Fig. 8-1.

D. Make sure that the neutral conductor is carrying only that neutral current associated with the breaker's load current (neutral not shared with other loads.)

Step 5.

If the preceding steps fail to identify the problem, then measure the sensor resistances. Since the phase and neutral sensors are electrically identical, their resistance should closely agree.

Table 8-1. Resistance Values

Frame Size	CT Rating	Resistance in Ohms
AK-15	150	7-15
	225	12-20
AK-25	225	12-20
AKU-25	600	40-50
AKR-30S	150	6-14
AKRU-30S	400	21-25
	800	59-70

SECTION 8 TESTING AND TROUBLESHOOTING

Cabling Diagrams

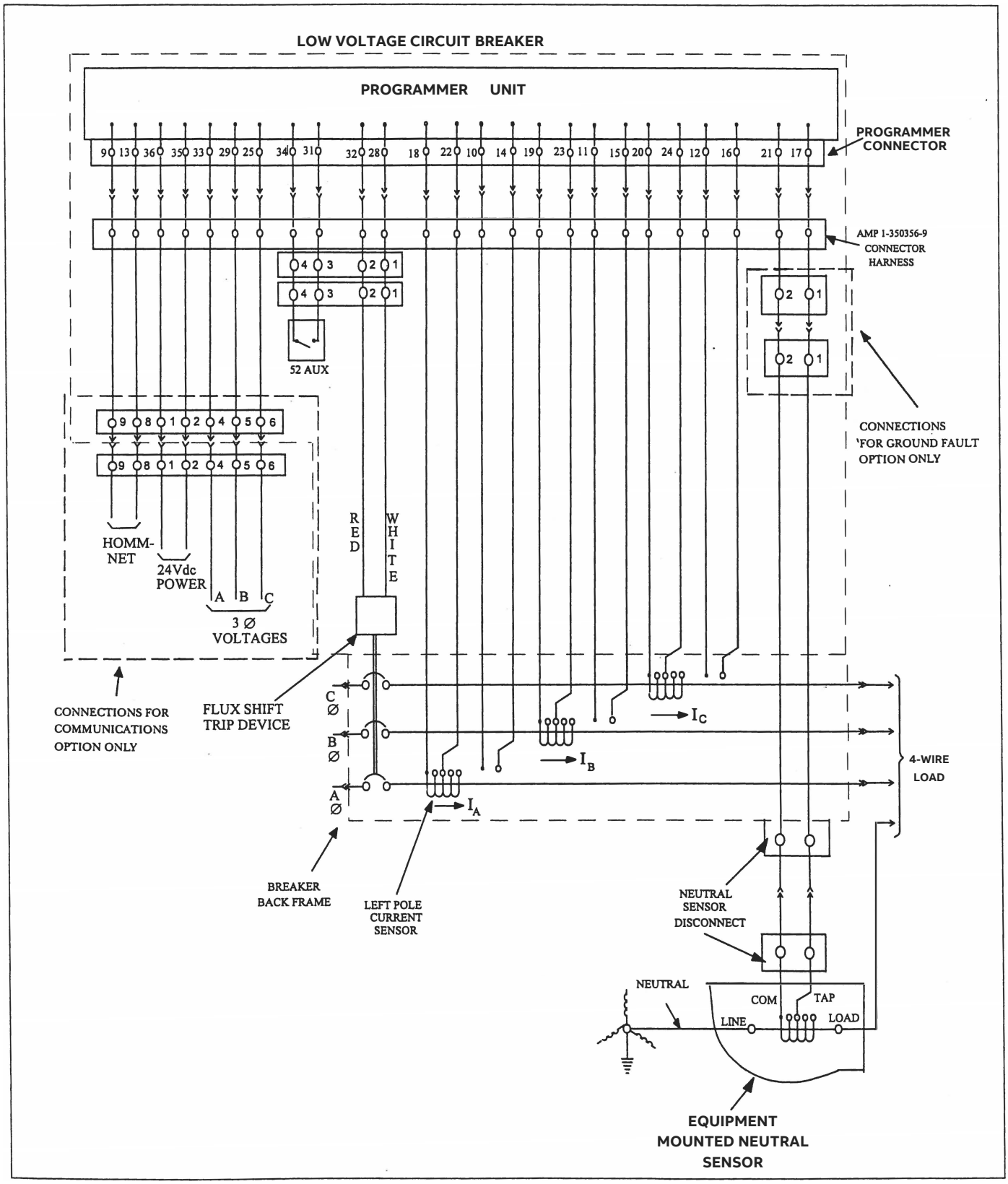

Fig. S-1. Cabling Diagram- MicroVersaTrip® Plus and PM With Ground Fault On Four-Wire Load.

These instructions do not cover all details or variations in equipment nor do they provide for every possible contingency that may be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purposes, the matter should be referred to the ABB Inc.

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